HM TREASURY

UK country fiche on pension projections

Revised draft version following the peer review by the Ageing Working Group

December 2017

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Part 1 - Overview of the pension system

1.1 Description

1.1.1 The current State Pension system

The UK introduced the new State Pension in April 2016 for people who reach State Pension age from then onwards. It replaces the previous two tier State Pension system. The State Pension is financed through a National Insurance system. Participation in the State Pension system is mandatory. Qualifying years can be made up from qualifying paid contributions, credits and voluntary contributions.

The full rate of the new State Pension is £159.55 a week (2017/18) (set above the basic level of means-tested support) but not everyone will receive the full amount in the early years. People with no National Insurance record before 6 April 2016 who gain 35 qualifying years will receive the full weekly amount when they reach State Pension age. People with NI contributions from before April 2016 will have calculations made under transitional arrangements, which take their past National Insurance record into account. To receive the new State Pension people will need a minimum of ten years on their National Insurance record.

The State Pension cannot be taken up before the State Pension age, but may be deferred in return for a higher State Pension (1% per 9 weeks of deferral, or approximately 5.8% per year).

The National Insurance system

National Insurance contributions (NICs) are social security contributions charged on earnings, and are paid by employers, employees and the self-employed. There are four ways to gain entitlement to the new State Pension via the NICs system:

- Employees must pay Class 1 NICs to gain entitlement. In 2017-18, employees pay 0% on earnings between £113 and £157 per week, pay 12% on earnings between £157 and £866 per week, and 2% on earnings above this.
- The self-employed must pay Class 2 NICs to gain entitlement. In 2017-18, this is a flat weekly rate of £2.80. They also pay Class 4 NICs, which provides no entitlement. In 2017-18, Class 4 NICs is 9% on profits between £8,164 and £45,000 per year, and 2% on profits above this.
- Individuals can purchase Class 3 NICs on a voluntary basis to fill or avoid gaps in their National Insurance record. In 2017-18, this is a flat weekly rate of £14.25.
- NICs credits provide entitlement without having to pay NICs for special groups e.g. parents of children under 12 or those who are claiming certain other benefits.

Employer NICs provides no entitlement to the new State Pension. Employers pay 13.8% NICs on all earnings above £157 per week for an employee in 2017-18. For employees aged below 21-years-old or apprentices aged below 25-years-old, employers pay 0% up to £866 per week and 13.8% above this.

State Pension age

Currently men can claim their State Pension from age 65 whilst women's State Pension age is gradually increasing over the period 2010-2018 from 60 to equalise with men's State Pension age at 65 by November 2018. Both will then increase to 66 over the period 2018-2020 and to 67 in 2026-28.

The State Pension age is currently legislated to increase to 68 in 2044-46. However, the Government completed its first regular State Pension age review in July 2017, which announced that the increase to 68 will be brought forward to 2037-39. More information on the State Pension age review process, including the most recent review, can be found in Section 1.4 (recent reforms of the pension system).

Uprating

Legislation requires that the new State Pension be uprated annually at least in line with average earnings. However, the Government has discretion to uprate by a different, more generous, index. Since 2011, the Government has chosen to increase the new State Pension by the "Triple Lock" - the highest of average earnings, the Consumer Price Index (CPI) or 2.5%. Following the general election in June, the Confidence and Supply Agreement between the Conservative and Unionist party and the Democratic Unionist Party[1] set out that: "Both parties have agreed that there will be no change to the Pensions Triple Lock" for the remainder of the parliament (which is due to end in 2021/22).

Pensioner benefits

Individuals above the female State Pension age have access to Pension Credit, a means-tested benefit mainly comprising of Guarantee Credit, whereby those with total weekly income below the Standard Minimum Guarantee (£159.35 for 2017/18) will receive a 'top up' payment. Pensioners can also receive other UK benefits such as disability benefits provided they meet the relevant criteria. There are also universal benefits for those who reach a certain age including the Winter Fuel Payment, free eye tests, free prescriptions and free bus travel.

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[1] https://www.gov.uk/government/publications/conservative-and-dup-agreement-and-uk-government-financial-support-for-northern-ireland

The guaranteed minimum level of Pension Credit must be uprated annually at least in line with average earnings. All other elements of the state pension system subject to uprating are uprated by prices.

1.1.2 Change from old system and transition arrangements

As discussed in the UK pensions fiche for the 2015 Ageing Report[2], prior to 6 April 2016 the UK State Pension system consisted of a basic State Pension and an earnings-related additional component (various schemes depending on time of retirement). This system continues to remain in place for all individuals who reached State Pension age prior to the introduction of the new State Pension in April 2016. The basic State Pension required 30 years of National Insurance contributions or credits for the full award of £122.30 per week (2017/18). Those with fewer than 30 years National Insurance record received a proportionate amount, with no requirement to have a minimum number of NICs to claim. Individuals could choose to defer taking their State Pension in return for an increment of 1% per 5 weeks of deferral (approximately 10.4% per year), with the option to receive this as a lump sum if deferring for a year or more. The basic State Pension must be uprated at least in line with average earnings, but has been uprated by the Triple Lock since 2011, while the various additional State Pension amounts must be uprated at least in line with prices, of which CPI is the measure currently used.

Those reaching State Pension age before the introduction of the new State Pension can also access the Savings Credit element of Pension Credit. Savings Credit further rewards Pension Credit recipients who have made some provision for their retirement, by paying them 60p for every £1 of income they have below a certain level (known as the Savings Credit threshold), up to a maximum of £13.20 per week for a single person and £14.90 per week for a couple (2017/18). Savings Credit is no longer available for those retiring after April 2016 as the full new State Pension award is above the level of the Standard Minimum Guarantee.

Some adjustments were made to ensure fairness during the transition from the previous system to the new State Pension system. Transitional arrangements apply to those with a National Insurance record before 6 April 2016. These arrangements were carefully designed not to disadvantage people on either side of 6 April 2016. To ensure fairness, people do not automatically receive the full rate as their previous National Insurance record is taken into account. No one will receive less from the new State Pension than they would have done from the previous system, based on their National Insurance record up to 6 April 2016.

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[2] https://europa.eu/epc/sites/epc/files/docs/pages/united_kingdom_-_country_fiche_on_pensions.pdf

All who built entitlement under the old system are given a "starting amount" which is the higher of what their National Insurance record to 6ᵗʰ April 2016 would provide under either the previous or new system rules. Those with a higher starting amount than the full rate of the new State Pension award receive the difference as a protected payment. Those with a lower starting amount than the full amount of new State Pension can add further qualifying years worth 1/35 of the full amount until they reach the full amount or their State Pension age, whichever comes first.

Additionally, under the previous system individuals could contract out of the earnings-related additional State Pension and pay lower National Insurance contributions in return. Entitlement to the new State Pension is reduced to account for the reduced contributions made by those who have contracted out. Contracting out is not available under the current system.

Under the previous system, the pension award received varied significantly depending on the level of additional pension built up. The introduction of the new State Pension has made the system simpler as, after the transitional period, all individuals with a full National Insurance record will receive the same entitlement regardless of earnings – as seen in diagram below. In the short term the cost of the new system is roughly equivalent to the previous system, but in the long term the system will become more sustainable as over time fewer people are enrolled in the additional pension - as highlighted in the Ageing Report of 2015.

Comparison of the New State Pension (Single tier) with the previous system
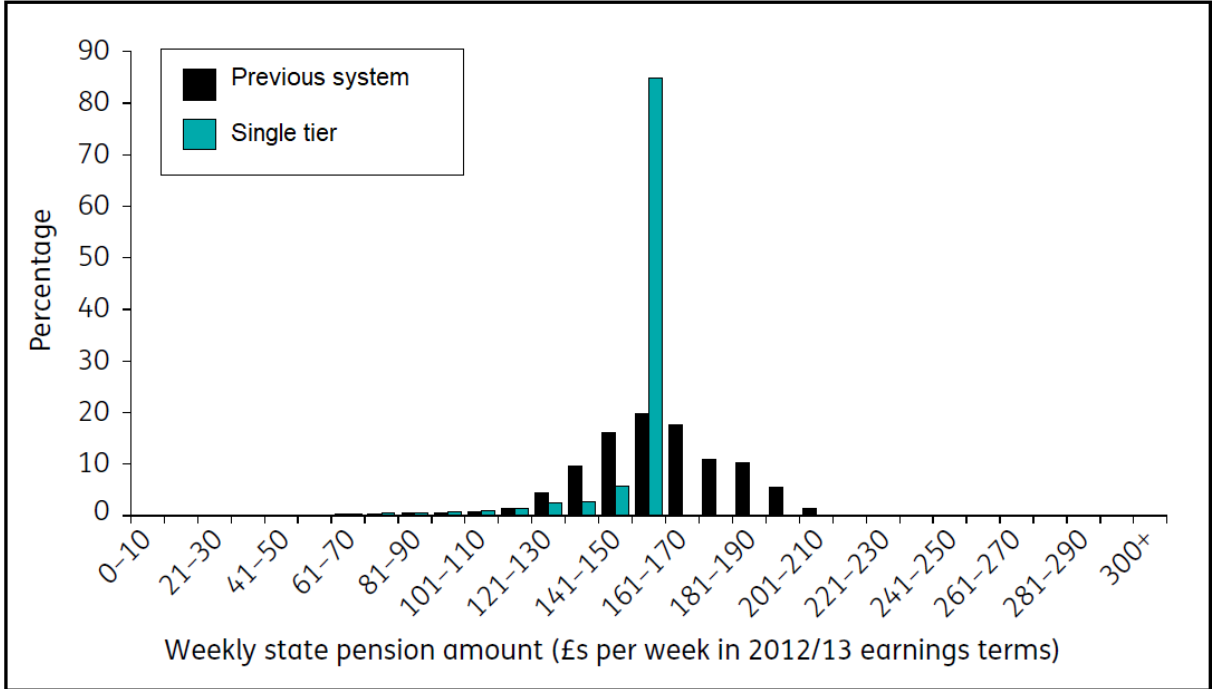
1.2   The Private Pension System

There are two types of occupational schemes offered by employers, defined benefit (DB) - pensions based on years of service and final pay, or on career average revalued earnings – and defined-contribution (DC) - pensions based on contributions and the investment returns they generate.

The Government has implemented a major reform, first introduced in October 2012, which means that employers also now have a duty to automatically enrol workers into a pension. To this end the UK has established the National Employment Savings Trust (NEST), a DC scheme that employers may use to fulfil their obligation. However, as employees may continue to opt-out of these pensions, the private pensions system is not mandatory. So far, the automatic enrolment policy has been a success, with over 8.1 million individuals newly saving or saving more to the end of June 2017. To this date, about 9% of employees have opted out of being automatically enrolled into a workplace pension.

Personal pensions, created in 1988, offer a private means of saving for retirement to those without access to an occupational scheme or who change jobs frequently. Personal pensions are largely DC schemes as described above.

These reforms do not affect these projections, as private pensions have not been modelled.

1.3   Public Service Pension Schemes

There are 8 main categories of occupational pension schemes in the UK for public service workers, which autonomously manage the pensions of staff in the NHS, teachers, civil servants, staff in local government, police officers, firefighters, the armed forces and judges, and which are under the direct control of Ministers. These schemes pay out benefits in addition to and separately from the State Pension, and are based on a member's time in service and earnings. Together, these pension schemes are known as Public Service Pension schemes (PSPs). There are also around 300 smaller Non-Departmental Public Body Pension Schemes, which are partly funded through Government grants, and which have more autonomy in designing and administering their pension schemes.

Scheme benefits vary from one scheme to another; with some being based on a member's final salary and others on a member's career average revalued earnings. Schemes also have different accrual rates, revaluation rates, Normal Pension Ages, employee and employer contribution rates, lump sum commutation rates and indexation rates.

As detailed in previous versions of the UK pensions fiche, the 2011 change in indexation of PSPs (moving from RPI to CPI) contributed strongly to the sustainability of the PSP system. Furthermore, in 2013, most PSP schemes moved from being calculated based on 'career final salary' to 'career average salary', thereby further decreasing PSP expenditure and increasing the sustainability of the system.

1.4   Recent reforms of the pension system

In light of continuing increases in life expectancy, the Government recognised the need for a structured framework to lock State Pension age into a coherent strategy for the whole of the pensions system. This was delivered through the Pensions Act 2014, which requires the Government to conduct periodic reviews of State Pension age at least once every 6 years. Each review should follow the framework for considering changes to State Pension age set out by the Government in the January 2013 White Paper *'The single-tier pension: a simple foundation for saving',* which stated that any change:

- should be based on maintaining a given proportion of adult life in receipt of State Pension;
- should take into account the latest demographic data available and be informed by wider factors that could be taken into account when setting State Pension age; and
- should seek to provide a minimum of 10 years' notice for individuals affected by changes to State Pension age.

To this end, the Pensions Act 2014 requires the Government to commission both a report by the Government Actuary and a report by an Independent Reviewer, to inform the Government review and ensure that it is based on the most recent data.

In July 2017, the Government completed the first review into the State Pension age[3]. This review was informed by a report by the Government Actuary[4] and a report by independent reviewer John Cridland CBE[5]. In its final report, the Government announced it will bring forward the increase in State Pension age to 68 from 2044-46 to 2037-39, and that in the long run the State Pension age timetable should follow the principle of up to 32% of adult life spent in retirement.

There will be a further review before legislating to bring forward the rise in State Pension age to 68, to enable consideration of the latest life expectancy projections and to allow an evaluation of the effects of previous increases in State Pension. The publication of the

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[3] https://www.gov.uk/government/publications/state-pension-age-review-final-report
[4] https://www.gov.uk/government/publications/state-pension-age-periodic-review-report-by-the-government-actuary
[5] https://www.gov.uk/government/publications/state-pension-age-independent-review-final-report

State Pension age review and the announcement of the planned changes is part of the Government's commitment to have a clear baseline and managed pace of change that will ensure adequate notice, including seeking to provide people with 10 years' notice of any changes to their State Pension age.

1.5   Description of the constant policy assumptions used in the projection

The UK's Office for Budget Responsibility (OBR)[6] produces regular Fiscal Sustainability Reports[7] which set out long-term projections for spending, revenue and financial transactions, and assess whether they imply a sustainable path for the public finances.

On pensions, they make two important assumptions on the path of the State Pension age and the mechanism used to uprate the State Pension. These have had to be amended for the purposes of these projections to meet the definition of constant policy, as defined by the Ageing Working Group (AWG). The details of these adjustments are set out below:

State Pension age

The Government has legislated for a review of the State Pension age to take place at least once every six years. These reviews are informed by a technical assessment by the Government Actuary and an additional report considering other relevant factors. Details of the core principle to guide that review were set out alongside Autumn Statement 2013: that people should expect to spend on average a up to a third of their adult life (beginning from age 20) in receipt of the State Pension, with at least ten years' notice provided and changes being phased in over two years. In their most recent projections (published in January 2017), the OBR assumed that State Pension age will increase such that the average individual will spend 33.3% of adult life above State Pension age (this is also known as the longevity link).

Neither the OBR's longevity link assumption or the specific changes announced in the recent State Pension age review have been incorporated in these projections. This is because they have not yet been legislated for, and hence do not meet the AWG agreed definition of 'constant policy'.

The 'constant policy' assumption requires us to only take into account policy changes that have been legislated for. Therefore, the projections included in this report are based on the legislated timetable for increasing the State Pension age, which is set out below:

- Female State Pension age rising to 65 (equal to male State Pension age) between April 2010 and November 2018;

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[6] http://budgetresponsibility.org.uk/
[7] http://budgetresponsibility.org.uk/fsr/fiscal-sustainability-report-january-2017/

- State Pension age rising to 66 between December 2018 and April 2020;
- State Pension age rising to 67 between April 2026 and April 2028; and
- State Pension age rising to 68 between April 2044 and April 2046;

<u>State Pension uprating</u>

As discussed in Section 1.1.1, since 2011, the State Pension has been uprated each year by the Triple Lock, where pensions increase by the highest of CPI, average earnings growth or a 2.5% underpin. Triple lock uprating has been included in these projections until 2021-22, to reflect the Government's commitment to keep it in place for the duration of the current parliament. To meet the 'constant policy' assumption, after 2021-22 the State Pension is uprated by average earnings (as required by legislation). This reflects the fact that the Triple Lock has not been legislated for.

<u>Implications for the projection</u>

The combination of different policy, population and macroeconomic assumptions between the OBR's Fiscal Sustainability Report and the projections provided for the 2018 Ageing Report mean that the two sets of figures are not directly comparable. However, both projections indicate that demographic change will put upwards pressure on pension spending over the coming decades.

The adjustments we have made to the assumptions used in the FSR have different implications for the projection of pension spending, relative to that included in the OBR's report. All else equal, using only the legislated timetable for increases to the State Pension age results in a higher spending projection relative to FSR. On the other hand, not incorporating the Triple Lock over the entire projection horizon results in a relatively lower spending projection, which likely outweighs the effect of the State Pension age assumption.

Part 2 - Demographic and macroeconomic projections

This section of the fiche considers the demographic and macroeconomic assumptions used to produce the projections. It also focuses on how these have change compared to those used in the 2015 Ageing Report.

2.1   Demographic development

Table 1 shows how a number of key demographic variables are expected to evolve over the projection period.

Table 1	Main demographic variables evolution							
	2016	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak year***
Population (thousand)	65,607	67,466	71,758	75,152	77,670	79,419	81,041	2070
Population growth rate	0.7	0.7	0.6	0.4	0.3	0.2	0.2	2016
Old-age dependency ratio (pop65/pop15-64)	27.9	29.3	34.4	38.5	40.2	43.5	46.0	2070
Ageing of the aged (pop80+/pop65+)	26.9	27.4	31.1	33.1	39.2	37.9	40.3	2070
Men - Life expectancy at birth	79.6	80.2	81.6	83.0	84.2	85.4	86.5	2070
Men - Life expectancy at 65	18.8	19.2	20.1	21.1	22.0	22.8	23.6	2069
Women - Life expectancy at birth	83.3	83.9	85.3	86.7	87.9	89.0	90.1	2070
Women - Life expectancy at 65	21.3	21.7	22.8	23.8	24.8	25.7	26.5	2070
Men - Survivor rate at 65+	87.5	88.2	89.9	91.3	92.5	93.5	94.4	2070
Men - Survivor rate at 80+	60.2	62.1	66.7	70.8	74.5	77.7	80.6	2070
Women - Survivor rate at 65+	91.7	92.2	93.4	94.4	95.2	95.9	96.5	2070
Women - Survivor rate at 80+	71.4	73.2	77.1	80.5	83.4	85.9	88.1	2070
Net migration	244.0	251.5	220.1	181.0	134.2	121.1	107.3	2017
Net migration over population change	0.5	0.5	0.6	0.6	0.6	0.8	0.7	2059

Source: Eurostat, EU Commission.

The Eurostat population projections show the UK's population rising, from 65.6m in 2016 to 81.0m people in 2070. The UK is currently the second most populous member state but according to Eurostat projections it will become the most populous in 2070.

The UK population projection is broadly unchanged compared to the previous Eurostat projection used in the 2015 Ageing Report. As the chart below shows, the UK population is projected to be marginally higher between 2016 and 2050, but comparing the two projections in year 2060, the latest projection is lower (79.4m compared to 80.1m previously.

Comparison of UK population in AR18 vs. AR15
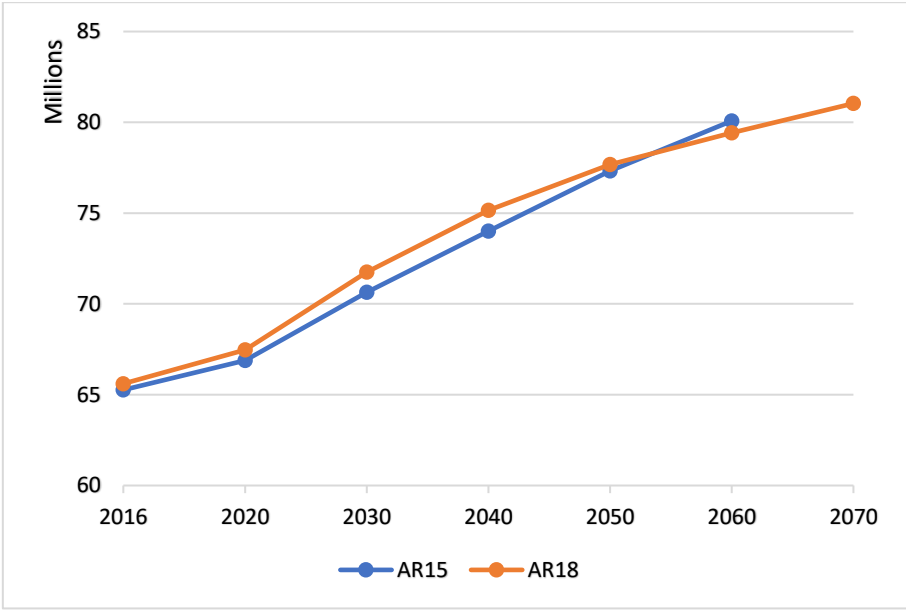
However, the age structure of the UK population is expected to change significantly over the projection period. The age pyramid chart shows the number of males and females in different age categories in 2016 compared to 2070.

UK age pyramid comparison: 2016 vs 2070
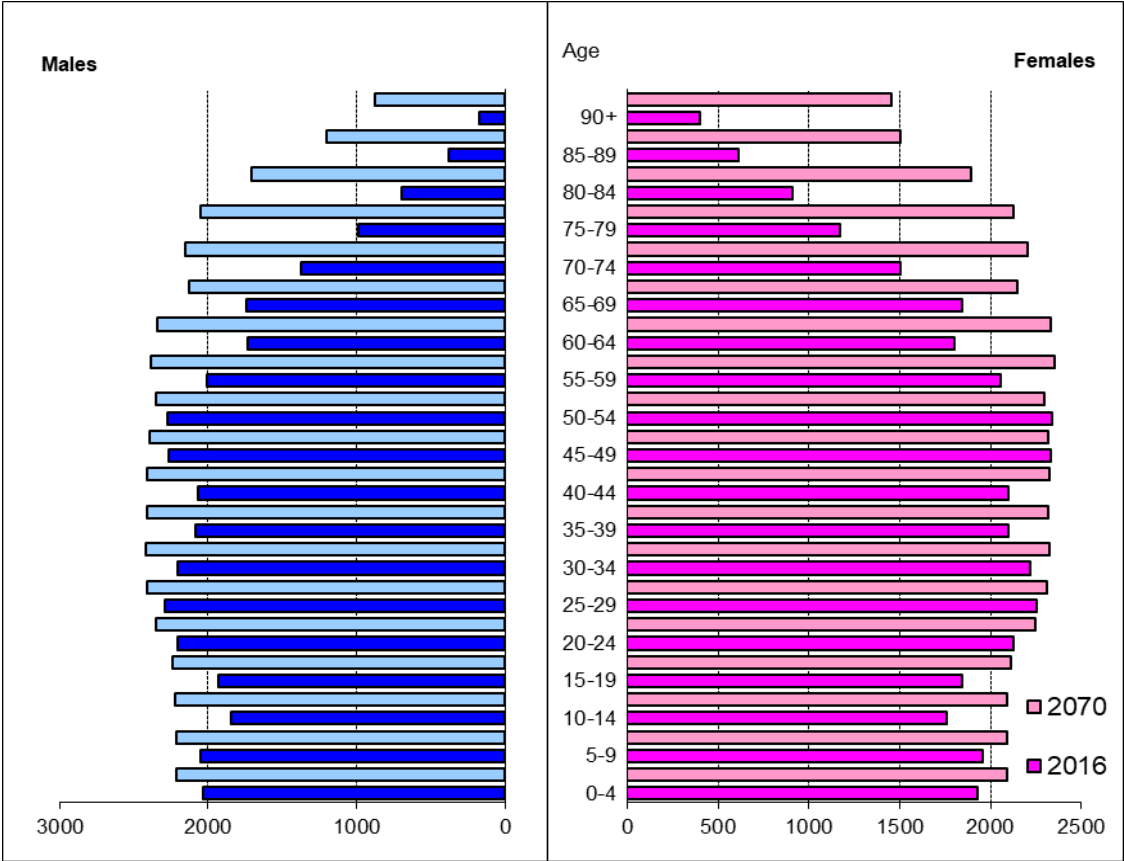
The change in the age-structure of the population means that the old-age dependency ratio[8] is projected to increase from 27.9 in 2016 to 43.5 in 2060, and then 46.0 in 2070. This is marginally below the EU-wide level.

Throughout the projection period the old-age dependency ratio is broadly in line with what was anticipated in the 2015 Ageing Report. However, towards the end of the projection period the trend diverges slightly and we see a more significant ageing effect between 2050 and 2060. This results in the old-age dependency ratio reaching 43.5 in 2060, rather than 42.8, as projected in the last Ageing Report. The trend then moderates slightly but the old-age dependency still reaches 46.0 in 2070.

Comparison of UK old-age dependency ratio in AR18 vs. AR15
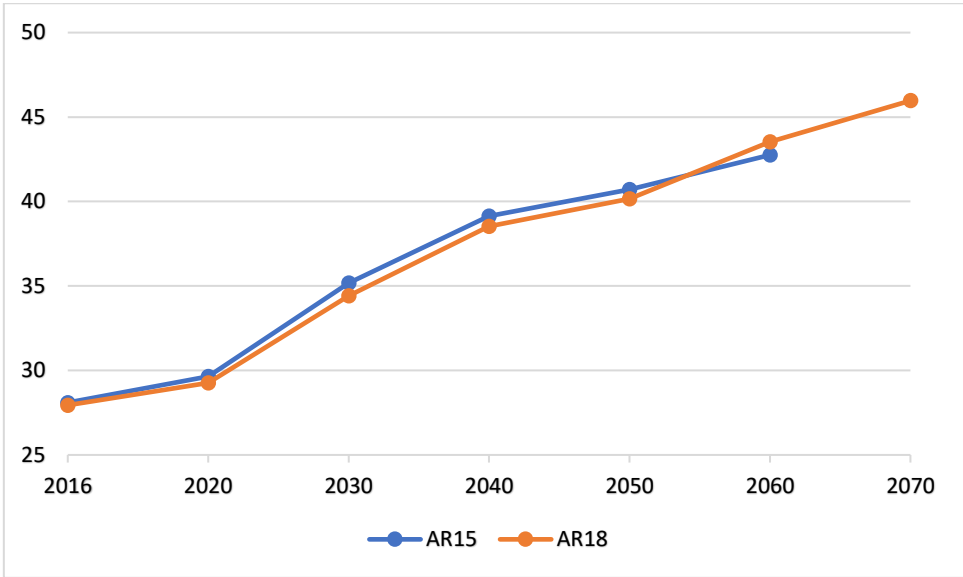
The Eurostat net migration projection has changed significantly since the last Ageing Report. As shown in the chart below, while net migration starts at a much higher level than projected in the 2015 Ageing Report, over the projection period it falls to a much lower long-term level. In 2060, net migration (000's) is projected to be 121.1 which is a reduction of just over 50,000 from the level anticipated in the 2015 Ageing Report – 171.2 for the same year.

As migrants tend to be concentrated at working ages, the change in this assumption may be part of the reason the UK's old-age dependency ratio is projected to increase by more than was expected in the last Ageing Report.

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[8] This is defined as the population aged 65 and over as a percentage of the population aged 15-64
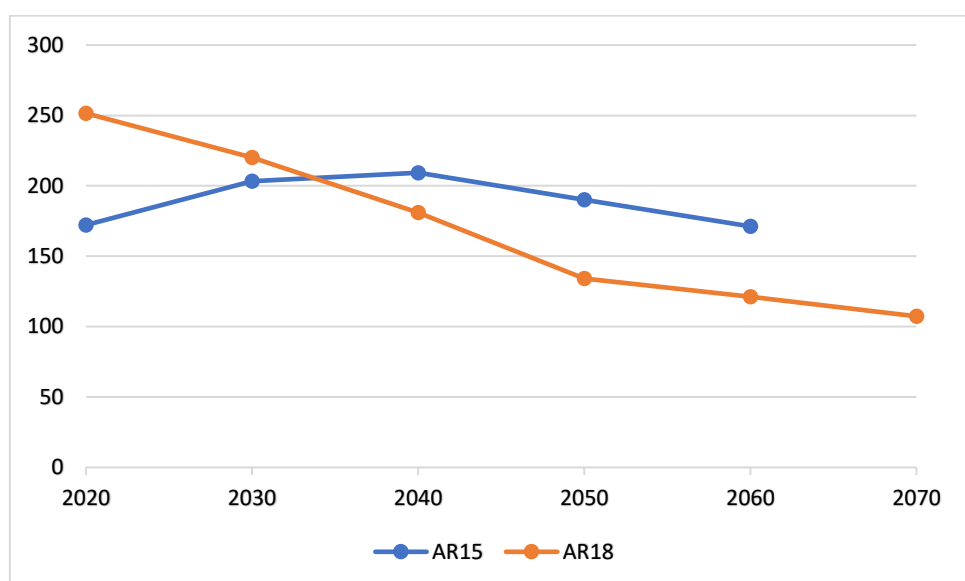
Table 2 shows how labour force characteristics of older workers are projected to develop over the projection period.

Table 2	Participation rate, employment rate and share of workers for the age groups 55-64 and 65-74							
	2016	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak year***
Labour force participation rate 55-64	66.0	66.7	68.9	71.1	73.7	73.9	74.2	2066
Employment rate for workers aged 55-64	63.5	63.9	65.8	67.9	70.3	70.5	70.8	2066
Share of workers aged 55-64 on the labour force 55-64	96.3	95.8	95.5	95.4	95.4	95.4	95.4	2016
Labour force participation rate 65-74	16.8	14.8	16.3	16.7	21.0	22.4	21.8	2058
Employment rate for workers aged 65-74	16.6	14.5	15.9	16.4	20.5	21.9	21.4	2058
Share of workers aged 65-74 on the labour force 65-74	98.6	98.2	97.9	98.0	97.9	97.9	98.0	2016
Median age of the labour force	40.0	39.0	39.0	40.0	40.0	41.0	41.0	2051

Source: Eurostat, EU Commission.

The UK has historically had a higher than EU average participation rate in the labour market, and this trend is expected to continue. Among older workers the projected participation rate increases as the population ages. For those aged 55-64 this rises from 66% in 2016 to 74% in 2070; for those aged 65-74 this rises from 17% in 2016 to 22%

in 2070. These labour market indicators are projected to evolve in much the same way, and to a similar extent, as they were in the 2015 Ageing Report.

TABLE 3a	Labour market effective exit age and expected duration of life spent at retirement - MEN							
	2017	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak year**
Average effective exit age (CSM) (II)	65.0	64.8	65.1	65.1	65.8	65.8	65.8	2049
Duration of retirement	18.9	19.2	20.1	21.1	21.1	21.9	22.7	2069
Percentage of adult life spent at retirement	28.7	29.1	29.9	31.0	30.6	31.4	32.2	2069
Early/late exit	1.5	1.2	1.2	1.3	1.4	1.5	1.5	2052

TABLE 3b	Labour market effective exit age and expected duration of life spent at retirement - WOMEN							
	2017	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak year**
Average effective exit age (CSM) (II)	63.8	64.5	65.1	65.1	65.8	65.8	65.8	2048
Duration of retirement	22.2	21.7	22.8	23.8	23.9	24.8	25.6	2070
Percentage of adult life spent at retirement	32.7	31.8	32.6	33.6	33.4	34.2	34.9	2070
Early/late exit	1.3	1.6	1.5	1.5	1.4	1.5	1.5	2026

Source: Eurostat, EU Commission.

The labour market effective age of exit also increases over the projection period, particularly for women. However, this does not keep pace with increases in longevity, and so proportion of adult life spent in retirement also increases across the projection period for both genders. As with the other labour market indicators discussed above, these measures are also projected to develop is broadly the same way as anticipated in the 2015 Ageing Report.

Part 3 - Pension projection results

3.1   Extent of the coverage of the pension schemes in the projections

These projections include the new State Pension and protected payments, basic State Pension, graduated retirement pension, lump sum payments, additional State Pension (state second pension, SERPS), non-contributory pension and Pension Credit. It also includes the pensioners' Winter Fuel Payment, housing benefit for pensioners, a free TV licence for those over 75 and a £10 Christmas bonus paid to those receiving the State Pension.

As was the case for the 2015 Ageing Report, we have not included disability benefits for pensioners, as this is not a pension, and seems to be excluded by the guidance.

We have not included any projections for PSPs in our central pensions projection tables, as projections for PSPs are done by the Government Actuary's Department, whose model is not configured to use the EU macroeconomic assumptions. However, we have provided a separate estimate for spending on PSPs in Section 3.5.

The ESSPROS assumptions below include Public Service Pensions, and hence have higher projected expenditure. Note that we have used a Euro to Sterling conversion rate of 0.805942 (from the HMRC 2016 average). As the UK works in financial years (beginning April), we have used the uprating index for year Y to provide the uprating for year $Y+1/Y+2$. This is because under UK benefit uprating, indices for July and September in 2016 will be used to determine benefit rates in 2017/18. In the output tables, financial years are presented.

TABLE 4	Eurostat (ESSPROS) vs. Ageing Working Group definition of pension expenditure (% GDP)							
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
1 Eurostat total pension expenditure	9.8	10.2	11.3	11.4	11.4	11.7	11.5	11.3
2 Eurostat public pension expenditure	6.1	6.3	7.0	6.9	6.9	7.0	6.8	6.7
3 Public pension expenditure (AWG)	:	:	:	5.5	5.6	5.7	5.7	5.9
4 Difference (2) - (3)	:	:	:	1.4	1.3	1.2	1.1	0.7

Source: Eurostat, EU Commission.

3.2   Overview of projection results

Under the AWG approach as per Table 5, pension expenditure for the UK is projected to increase between 2016 and 2070, from 5.7% of GDP to 7.4% in 2070.

TABLE 5	Projected gross and net pension spending and contributions (% of GDP)							
Expenditure	**2016**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak year***
Gross public pension expenditure (excluding PSP)	5.7	5.5	5.8	6.5	6.4	6.9	7.4	2069

Spending (as a proportion of GDP) falls between 2016 and 2020 due to the acceleration in female State Pension age rises between 2010 and 2018, and a general rise in male and female State Pension ages between 2018 and 2020.

The projected increase in spending is largest between 2030 and 2040, which is partially due to the retirement of the baby boomer generation. The (currently) legislated change in SPA in the mid-2040's results in projected spending levelling off up to around 2050. After this point is rises steadily for the remainder of the projection period.

TABLE 6	Projected gross public pension spending by scheme (% of GDP)							
Pension scheme	**2016**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak year ***
Total public pensions	5.7	5.5	5.8	6.5	6.4	6.9	7.4	2069
of which								
Old age and early pensions:	4.9	5.0	5.4	6.1	6.0	6.5	7.0	2069
Flat component	3.8	3.9	4.8	5.9	5.9	6.5	7.0	2069
Earnings related	1.1	1.0	0.5	0.2	0.0	0.0	0.0	2016
Minimum pensions (non-contributory) i.e. minimum income guarantee for people above 65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2029

3.3 Main driving forces behind the projection results and their implications for main items from a pension questionnaire

Note that only a single table 7 is provided here. Since only the State Pension is being modelled, and since it is a universal pension, the number of pensioners and pensions is equal.

TABLE 7	Factors behind the change in public pension expenditures between 2016 and 2070 using pension data (in percentage points of GDP) - pensions							
	2016-20	**2020-30**	**2030-40**	**2040-50**	**2050-60**	**2060-70**	**2016-70**	**Average annual change**
Public pensions to GDP	-0.2	0.4	0.7	-0.2	0.5	0.5	1.7	0.028
Dependency ratio effect	0.2	1.0	0.7	0.3	0.5	0.4	3.1	5.7%
Coverage ratio effect	-0.5	-0.5	0.0	-0.4	0.0	0.3	-1.1	-2.0%
Cohort effect*	*0.0*	*-1.1*	*-0.6*	*0.1*	*-0.6*	*-0.3*	*-2.6*	*-5.0%*
Benefit ratio effect	0.0	0.0	0.1	0.0	0.1	-0.2	0.0	-0.4%
Labour Market/Labour intensity effect	0.0	-0.1	-0.1	-0.1	-0.1	0.0	-0.3	-0.6%
Employment ratio effect	*0.0*	*-0.1*	*-0.1*	*0.0*	*0.0*	*0.0*	*-0.2*	*-0.4%*
Labour intensity effect	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0%*
Career shift effect	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*0.0*	*-0.1*	*-0.2%*
Residual	0.0	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1%

* Sub components of the coverage ratio effect do not add up necessarily.

TABLE 8	Replacement rate at retirement (RR), benefit ratio (BR) and coverage by pension scheme (in %)						
	2016	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Public scheme (BR)	28%	28%	29%	29%	29%	30%	29%

TABLE 9	System dependency ratio and old-age dependency ratio						
	2016	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Number of pensioners (thousand) (I)	13165.4	12845.6	14186.0	16210.0	16295.8	17608.1	19568.7
Employment (thousand) (II)	32035.2	32479.0	33882.3	35091.7	36384.0	36769.7	36890.6
Pension System Dependency Ratio (SDR) (I)/(II)	41.1	39.6	41.9	46.2	44.8	47.9	53.0
Number of people aged 65+ (thousand) (III)	11799.9	12574.6	15256.0	17420.9	18600.0	20195.2	21452.4

Working age population 15 - 64 (thousand) (IV)	42225.2	42959.4	44313.7	45214.2	46313.6	46389.8	46665.4
Old-age Dependency Ratio (ODR) (III)/(IV)	27.9	29.3	34.4	38.5	40.2	43.5	46.0
System efficiency (SDR/ODR)	1.5	1.4	1.2	1.2	1.1	1.1	1.2

The driving force behind the increased expenditure as a proportion of GDP is mainly down to the dependency ratio effect, offset to some extent by the coverage ratio effect.

3.4 Sensitivity testing

Given the uncertainty surrounding the assumptions of long-run projections, it is necessary to carry out a number of sensitivity tests so as to quantify the responsiveness of projection results to changes in key underlying assumptions.

In all the scenarios that follow, our scenario modelling has been limited to changing the following inputs: CPI, earnings growth (calculated based on the average gross wage assumption), the Triple Lock (highest of CPI inflation, average earnings growth or a 2.5% underpin) (we model this in the medium term out to 2021/22 only), GDP deflator, nominal GDP, average gross wage (for the benefit ratio calculation), and populations (by age and gender).

Any other inputs/ factors have been left static. For example, the State Pension age has not been altered. We have not adjusted the rate of claiming of means tested benefits in any of the sensitivities and it has not been possible to update the labour market or State Pension age impacts to the model. Although several the inputs in the model cannot be adjusted, which can make it difficult to carry out sensitivity testing, we can make several observations about these results (for full results see Table 10).

In the next section, there is a description of each sensitivity scenario followed by a brief overview of how the result it generates diverges from the central projection.

- **Higher life expectancy:** A scenario with an increase of life expectancy at birth of about two years by 2070 compared with the baseline projection.

Projection results: compared to the baseline scenario, the assumption of higher life expectancy results in an increase in projected expenditure of 0.5ppt of GDP in 2070. As life expectancy increases, so do entitlement periods which causes an increase in pension expenditure.

- **Lower/higher total factor productivity (TFP) growth:** A scenario where TFP growth is assumed to converge by 2045 to a growth rate which is 0.4 p.p. lower/higher than in the baseline scenario (0.6% and 1.4% respectively in the two alternative scenarios). The increase is introduced linearly during the period 2026-2045.

Projection results: this scenario has a minimal impact on the projection results (less than 0.1ppt of GDP). The main transmission mechanism from TFP growth to pension expenditure is average earnings, however, although this is the mechanism used to uprated the State Pension in this projection, it appears that the change in GDP offsets this somewhat (i.e. spending as a proportion of GDP is similar).

- **Lower/higher employment rate:** A scenario with the employment rate being 2 p.p. lower/higher compared with the baseline projection for the age-group 20-64. The decrease/increase is introduced linearly over the period 2018-2030 and remains 2 p.p. higher thereafter. The higher employment rate is assumed to be achieved by lowering the rate of structural unemployment (the NAWRU).

Projection results: a rise in the employment rate compared to the baseline scenario is projected to cause a reduction in pension expenditure of 0.2ppt of GDP in 2070. On the other hand, a reduction in the employment rate is projected to cause an increase in expenditure, of equal magnitude.

- **Higher employment rate of older workers:** A scenario with the employment rate of older workers (55-74) being 10 p.p. higher compared with the baseline projection. The increase is introduced linearly over the period 2018-2030 and remains 10 p.p. higher thereafter. The higher employment rate of this group of workers is assumed to be achieved through a reduction of the inactive population.

Projection results: an increase in the employment rate of the elderly (55-74 years) in relation to the baseline scenario result in lower projected pension expenditure, of 0.4ppt of GDP in 2070.

- **Lower/higher migration:** A scenario with 33% less/more migration compared with the baseline projection.

Projection results: in the low migration scenario, projected pension expenditure is 0.4ppt of GDP higher in 2070 relative to the baseline. Lower migration leads to a lower working age population, resulting in an increase in the old-age dependency ratio. Higher migration has the opposite effect, leading to a reduction in projected expenditure relative to the baseline, of 0.3ppt of GDP in 2070.

- **Lower fertility:** A scenario with 20% lower fertility gradually by 2070 compared with the baseline projection.

Projection results: the low fertility scenario results in the biggest deviation from the baseline. Under this scenario, pension expenditure is projected to be 1.3ppt of GDP higher in 2070. In this scenario, GDP is projected to be significantly lower, meaning the change in expenditure/GDP is large in part due to a denominator effect.

- **Lower TFP growth (risk scenario):** A scenario where TFP growth is assumed to converge to 0.8% (the target rate) in 2045.

Projection results: as with the other TFP scenarios, this has a minimal impact on projected expenditure (of around +0.04ppt of GDP in 2070).

- **Policy-change scenario:** This scenario considers the adoption of an automatic mechanism. Retirement ages are shifted year-over-year in line with change in life expectancy at current retirement ages.

Projection results: This policy-change assumption leads to a reduction in projected pension expenditure of 0.5ppt of GDP in 2070 (relative to the baseline).

Sensitivity analysis: deviation from baseline projection in 2070 (ppt of GDP)
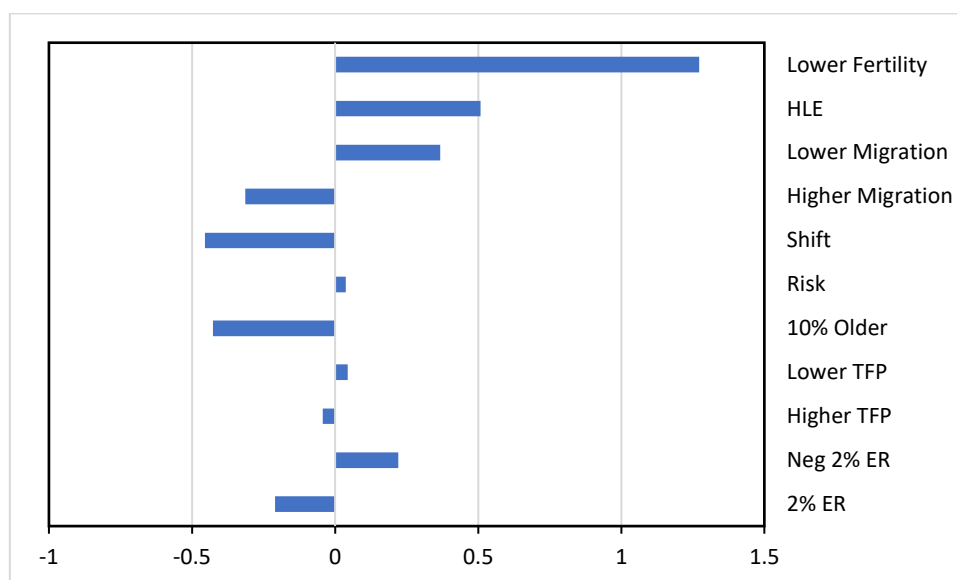
TABLE 10	Public and total pension expenditure under different scenarios (p.p. deviation from the baseline)						
Public Pension Expenditure	**2016**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Baseline	5.7	5.5	5.8	6.5	6.4	6.9	7.4
Higher life expectancy (2 extra years)	0.0	0.0	0.1	0.2	0.3	0.4	0.5
Higher Total Factor Productivity Growth (+0.4 pp.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lower Total Factor Productivity Growth (-0.4 pp.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Higher emp. rate (+2 pp.)	0.0	0.0	-0.2	-0.2	-0.2	-0.2	-0.2
Lower emp. rate (-2 pp.)	0.0	0.0	0.2	0.2	0.2	0.2	0.2
Higher emp. of older workers (+10 pp.)	0.0	-0.1	-0.3	-0.4	-0.4	-0.4	-0.4
Higher migration (+20%)	0.0	0.0	-0.2	-0.3	-0.4	-0.4	-0.3
Lower migration (-20%)	0.0	0.0	0.2	0.3	0.4	0.5	0.4
Lower fertility	0.0	0.0	0.0	0.2	0.4	0.8	1.3
Risk scenario	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Policy scenario: linking retirement age to increases in life expectancy	0.0	0.0	-0.1	-0.2	-0.2	-0.3	-0.5

3.5   Projections including Public Service Pensions

Although our central projection did not include PSPs we have included in this section a projection of total public pensions expenditure including a projection of expenditure on PSPs. This is to provide a comparison with previous years and give an idea of the relative magnitude of this line of spending.

This projection is based on the most recent modelling done by the Government Actuary (GAD) that was published in the OBR's Fiscal Sustainability Report in January 2017. The most recent FSR projection incorporates previous policy reforms: to increase employee contributions; uprate payments with CPI; and amend scheme benefits in line with the Public Service Pensions Act 2013, pensions including linking pension age to the State Pension age.

According to the OBR, gross PSP expenditure is projected to fall from 2.1% of GDP in 2021-22 to 1.3% of GDP in 2066-67. To a large extent, this decline reflects reforms that have been introduced since 2010 and the reductions to the public-sector workforce.

The OBR's projection for cash spending on PSPs was higher than in their previous report, which is mainly due to a revised workforce growth assumption. In previous FSRs, the OBR applied a uniform assumption for medium-term growth across all pension schemes. In the 2017 FSR, the OBR used disaggregated figures consistent with the 2015 Spending

Review settlements. They assume that the public-sector workforce will rise in line with total employment growth over the long term, this was 0.35 per cent a year in the latest FSR. Because of these and other smaller modelling changes, the OBR project spending on public service pensions to be 0.2 per cent of GDP higher in 2066-67 than in their previous report.

The projection of PSP spending provided in this report takes the latest OBR projection for nominal PSP spending and expresses this as percentage of GDP, using the level of GDP provided in the EU macroeconomic assumptions. The difference between the GDP assumption in the 2017 FSR and the 2018 Ageing Report mean that the path of PSP spending (expressed as a proportion of GDP) is different.

As shown in the table and chart below, the path for PSP spending is flat over the projection period when using the 2018 Ageing Report GDP assumption, at around 2% of GDP.

TABLE 11 Projected pension expenditure (% of GDP)								
Expenditure	**2016**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak**
Central projection	5.7	5.5	5.8	6.5	6.4	6.9	7.4	2069
Public Service Pensions	2.1	2.2	2.2	2.1	1.9	2.0	2.0	2025
Total*	7.7	7.7	8.0	8.6	8.3	8.9	9.5	2070

figures may not sum due to rounding

Projection of total pension expenditure: central projection plus PSPs
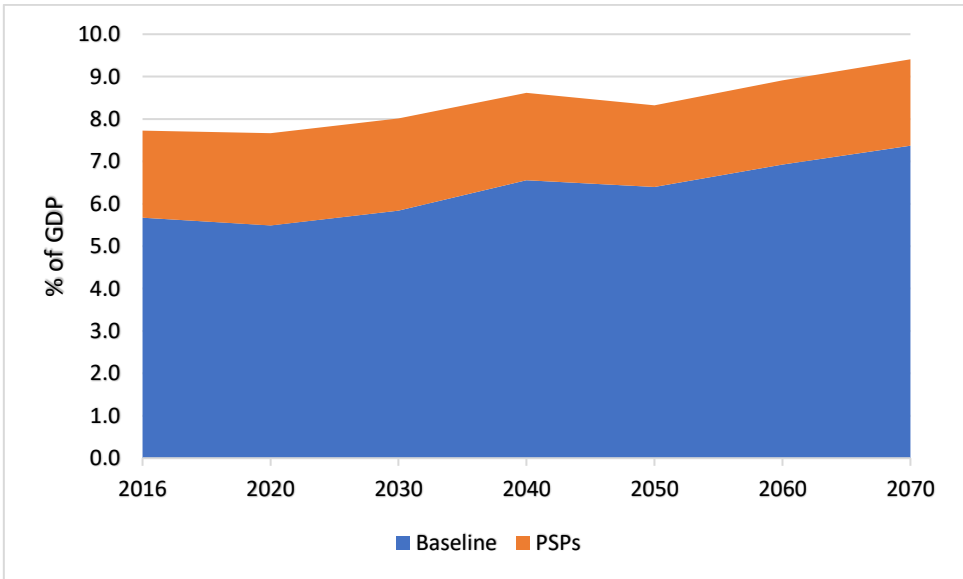
Compared to the 2015 Ageing Report, the projection for spending on PSPs is broadly similar. This reflects the fact that most of the measures designed to improve the sustainability of the system were also incorporated in the 2015 projection.

<u>Comparison of projected spending on PSPs in AR15 vs. AR18</u>
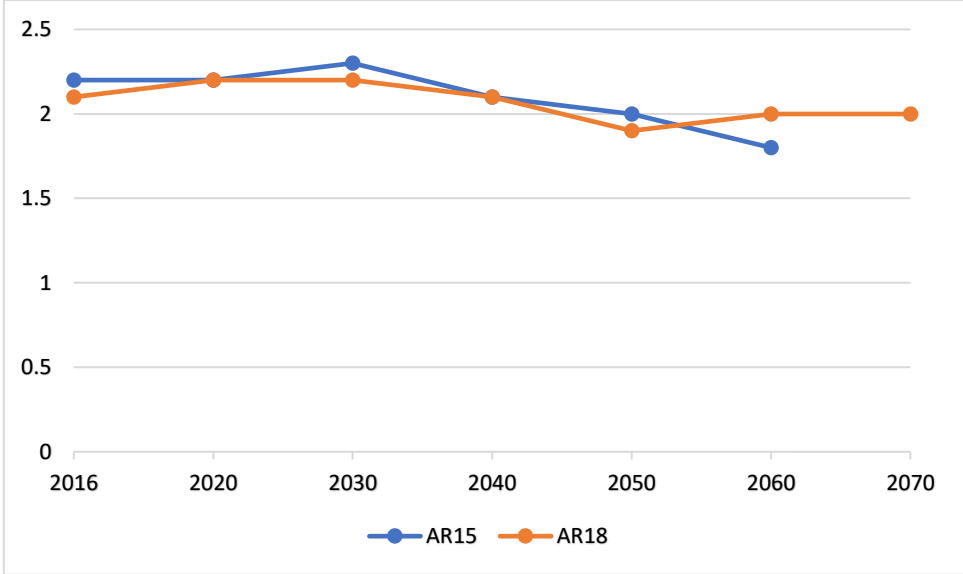
Source: HMT calculations based on the OBR Fiscal Sustainability Report 2017

3.6 Description of the changes in comparison with the 2006, 2009, 2012 and 2015 projections

TABLE 12	Overall change in public pension expenditure to GDP under the 2006, 2009, 2012 and 2015 projection exercises - pensions						
	Public pensions to GDP	**Dependency ratio**	**Coverage ratio**	**Employment effect**	**Benefit ratio**	**Labour intensity**	**Residual (incl. Interaction effect)**
2006 *	1.89	4.66	0.00	-0.13	0.00	:	-2.64
2009 **	2.70	4.25	-1.43	-0.29	0.51	:	-0.34
2012 ***	1.50	4.13	-1.85	-0.32	-0.10	0.01	-0.37
2015****	0.73	3.85	-1.58	-0.48	-0.73	0.00	-0.34
2018*****	1.75	3.14	-1.08	-0.18	0.04	0.02	-0.20

 * 2004-2050; ** 2007-2060; *** 2010-2060; **** 2013-2060; *****2016-2070

As the table shows, the projected increase in pension expenditure over the projection period is notably higher in the 2018 Ageing Report compared to the 2015 Ageing Report. This is headline measure is slightly misleading, and the two projections are very similar. Projected pensions expenditure was on an upwards trajectory in the final decade of the 2015 projection (2050 – 2060), and the new projection of the 2018 Ageing Report

essentially indicates that demographic developments will continue to put upwards pressure on spending, in the absence of further policy change[9].

The next chart shows a year-by-year comparison of projected spending in the two reports.

Comparison of the baseline projection in AR15 and AR18
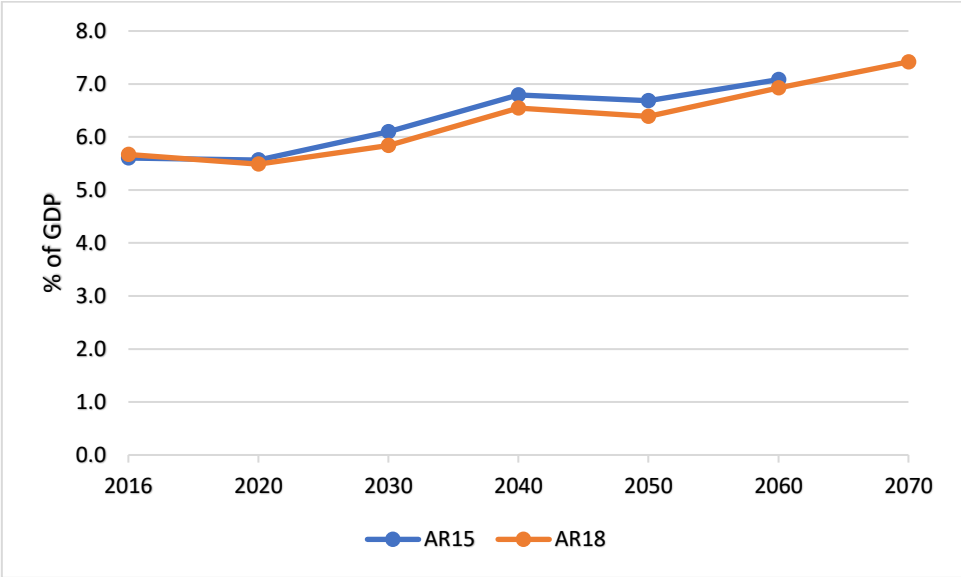
For most of the projection period, pension expenditure is projected to be lower than anticipated in the 2015 Ageing Report. This largely reflects demographic developments (see section 2 for a comparison of the projected old-age dependency ratio in the two projections). However, towards the end of the projection period, projected expenditure starts to converge, in line with the demographic developments. In the final years of the projection, the old-age dependency ratio is higher than anticipated in the 2015 Ageing Report, resulting in a steady rise in projected spending.

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[9] As discussed in Section 1.4, the Government recently completed the first review into the State Pension age. This announced measures that will improve the long-run sustainability of the UK pension system. However, as discussed in Section 1.5, they do not meet the agreed Ageing Working Group definition of 'constant policy' and as such have not been incorporated in the projection.

Part 4 - Description of the pension projection model and its base data

4.1 Institutional context in which those projections are made

These projections are run by the Department for Work and Pensions (DWP). The models used are principally for the provision of long-term pensioner benefit expenditure to the UK Office for Budget Responsibility. These are published annually in the Fiscal Sustainability Report (http://budgetresponsibility.org.uk/fsr/fiscal-sustainability-report-january-2017/) and on the DWP website (https://www.gov.uk/government/publications/benefit-expenditure-and-caseload-tables-2017).

4.2 Assumptions and methodologies applied

The projections are made up from a combination of four different models on an aggregate basis. For the EU Ageing Report projections, we have taken the projections produced for the 2017 Fiscal Sustainability Report forecasts as a starting point, and adjusted them as follows:

- changed the population assumptions to use those provided by the EU;

- changed the economic assumptions to use those provided by the EU (see further details below).

- our long-term projection models only extend to 2069. The projections have been extended an additional year to 2070, by maintaining expenditure as a constant proportion of GDP from 2069 (so the 2069 projections are scaled by the ratio of GDP in 2070 to GDP in 2069), using the GDP assumptions provided by the EU.

For uprating assumptions, we have used the CPI assumptions provided by the EU, and average earnings growth assumptions based on the gross mean earnings assumptions provided by the EU. This resulted in an average earnings growth assumption of 14.03% for 2015, which affects the 2016 projections. To avoid this extreme value we have instead used the UK Office for Budget Responsibility's assumption of 2.9% average earnings growth for 2015 only.

We made the following assumptions on pensioner benefits policy:

- on uprating of the State Pension, we assumed that the State Pension would be uprated by the triple lock (the highest of CPI, average earnings growth, or 2.5%) until 2021 after which it would be uprated by average earnings growth;

- on State Pension age, we used the currently legislated State Pension age timetable in the UK. This does not take into account the recommendations of the State Pension Age Review published in July 2017.

4.3   Data used to run the model

The models use a wide variety of administrative data collected in the process of assessing and paying DWP benefits; plus managing the National Insurance system in the UK. Some of the models also incorporate survey data from a variety of household surveys. The sources are given in more detail below, against the general description of each model.

4.4   Reforms incorporated in the model

Since the previous EU Ageing Report, we have added a new model to model the new State Pension, which applies to people reaching State Pension age from 6 April 2016 onwards.

4.5   General description of the model(s)

The models used consist of:

- a payouts-based model for basic State Pension, GRAD and lump sums, based on estimates/forecasts of pension payments at State Pension age for current and future pensioners;

- an accruals-based model for Additional Pension, in which estimates of entitlement accrued during people's working lives (revalued by earnings growth) are used to estimate their entitlements to Additional Pension from State Pension age.

- a payouts-based model for new State Pension, based on estimates/forecasts of pension payments at State Pension age for current and future pensioners.

4.5.1 The Basic State Pension model

General description of the model

The model is built in SAS and of an aggregate stock flow design. This means that it has inflows and outflows which are used to generate a caseload forecast each year. The caseload forecast is then multiplied by average amounts to create an expenditure forecast. This model also produces the GRAD forecast. Lump sums are modelled in a separate Excel model.

The aggregation in the model is as follows:

- Country of residence – GB, non-frozen rate overseas, frozen rate overseas.
- Sex – male, female.
- Marital status – male, single female, married female, divorced female, widowed female.
- Age – State Pension age up to age 125.
- Personal entitlement – 0%, 0-50%, 50-60%, 60-80%, 80-100%, 100%.
- Category of pension – A, B, D (which combined with marital status and personal entitlement information gives further breakdowns).

The model aggregation results in 17,550 groups. However many of these groups are not possible, such as anyone with Category D below age 80. Many assumptions used in the model are also generated at a higher level. For example mortality is only considered based on age, sex and country of residence which reduces the number of mortality assumptions to 650.

The flow diagram on the following page provides an overview of the major process that occur in the model.

```
┌─────────────────────┐        ┌─────────────────────┐
│ Proportion of cohort│        │ Population reaching │
│ with each % personal│        │ State Pension age   │
│ entitlement from L2 │        │ and deferral rates  │
└─────────────────────┘        └─────────────────────┘
           │                              │
           │                              ▼
           │                   ┌─────────────────────┐
           └──────────────────▶│ Marital status in   │
                               │ year of inflow      │
                               └─────────────────────┘
                                          │
┌─────────────────────┐                   ▼
│ Starting population │        ┌─────────────────────┐
│ from March QSE      │◀──┐    │ Annual inflows & %  │
└─────────────────────┘   │    │ Cat A entitlement   │
           │              │    └─────────────────────┘
           ▼              │               │
┌─────────────────────┐   │               │
│ Mortality           │   │               │
└─────────────────────┘   │               │
           │              │               │
           ▼              │               │
┌─────────────────────┐   │               │
│ Widowhood           │   │               │
└─────────────────────┘   │               │
           │              │               │
           ▼              │               │
┌─────────────────────┐   │               │
│ Transition &        │◀──┼───────────────┘
│ inflows             │   │
└─────────────────────┘   │
           │              │
           ▼              │
┌─────────────────────┐   │
│ Cat D inflows       │◀──┘
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│ End year caseloads  │
└─────────────────────┘
           │
           ▼                            ┌─────────────────────┐
┌─────────────────────┐                 │ L2 cohort based     │
│ Mid year caseloads  │                 │ average amounts     │
└─────────────────────┘                 └─────────────────────┘
           │                                       │
           │    ┌─────────────────┐                ▼
           ├───▶│ Additional      │     ┌─────────────────────┐
           │    │ components      │     │ Average amounts     │
           │    │ caseloads       │     │ from QSE            │
           │    └─────────────────┘     └─────────────────────┘
           │            │                          │
           ▼            ▼                          ▼
                                        ┌─────────────────────┐
                                        │ Annual uprating     │
                                        └─────────────────────┘
                                                   │
                                                   ▼
┌─────────────────────┐                 ┌─────────────────────┐
│ Annual expenditure  │◀────────────────│ Average amounts     │
└─────────────────────┘                 └─────────────────────┘
```

Calculation of inflow numbers

Cohort numbers

- Population projections provide numbers expected to reach State Pension age each year. This provides the total potential number of inflows which are then split by level of personal entitlement on a cohort basis. The numbers are then adjusted into year of inflow. For Great Britain it is assumed the entire State Pension age cohort will inflow at some point during the year.

- Overseas inflows are based on the growth in the Great Britain population reaching State Pension age.

Inflows above State Pension age

- Rates to calculate inflows above State Pension age come from estimates used in medium term forecasts. These are simplified and extended into the long term. The rates are derived using historic inflow numbers combined with population estimates to predict how many people with unclaimed entitlement are above State Pension age at a given point in time, and when they are expected to inflow in the future.

Marital status

- Marital status is determined at time of inflow based on age and sex. The numbers inflowing at each age are split by marital status projections. Together with the way widowhood is applied in the model this approach preserves the splits.

- For men, marital status data is not reliable enough be used directly. Instead marital status splits are imposed on the population using figures from the Office for National Statistics. Where men can be identified as widowers and they receive a Category B or AB pension they are assigned to the widower population. The remainder of the population is assigned randomly until the correct numbers of people are in both the widower and non-widower groups.

Marital status and personal entitlement levels

- Personal entitlement levels are not split by marital status. For men, it is assumed that entitlement can be applied uniformly across both marital status groups. For women, this assumption is less valid, especially under pre-reform rules where single women are much more likely to have a more complete contribution record than married women.

- Personal entitlement is calculated using both pre-and post reforms for all individuals. This is merged with the recently retired population making use of the marital status flag there. This allows conditional probabilities to be created that inform the likelihood of someone being in each personal entitlement group given the total number people in each marital status group, and also the total number of people from those groups in each personal entitlement group.

- As proportions in each personal entitlement group change for each cohort, and proportions in each marital status group change based on age and year of inflow, the respective numbers with each marital status in a given personal entitlement

group change. This does not affect the overall numbers who inflow with each level of personal entitlement, nor the total number from each marital status group.

Mortality

- Mortality rates come from the population projections split by sex and single year of age. The same rates are used for GB and overseas claimants, and are not adjusted for level of personal entitlement or marital status.

Average amounts

- In addition to the inflow figures, the model uses a number of average amounts to produce overall projections. The average amounts forecasts are calculated separately to the caseload forecast. It has the same aggregation as the caseload forecast so that average amounts can be applied directly to mid-year caseload to generate expenditure. The main calculations are:

  o Mean proportion of the standard rate at State Pension age - average amounts for each pension group in the model are combined with the full rate of Basic State Pension payable each year to convert the average amounts into mean proportions of the standard rate. This allows year on year averages to be compared.

  o Mean proportion of the standard rate above State Pension age - Above State Pension age future mean proportions are driven by applying observed year on year changes to preserve cohort effects.

Additional components

- Three types of transitions (i.e. a change in entitlement) are modelled: less than 60% Category to Category D for those 80 or above; less than 100% Category A or zero entitlement to Category B/BL or Category AB/ABL for those under 80; and conversion to Category B/AB on widowhood. A series of assumptions are used to estimate transitions across these different categories of state pension to take account of the change in pensioner entitlements.

Data sources

- The model uses data from the Quarterly Statistical Enquiry, a biannual 5 per cent sample of administrative data. In order to allocate people to the right group in the caseload forecast, data on personal entitlement to BSP is needed. This comes from the 'L2 dataset' (a 1 per cent sample of HM Revenue and Customs' National

Insurance Recording System). L2 shows the entitlement to BSP built up by each person in terms of qualifying years, whether as a result of paying NI contributions while working or as a result of building up credits. Age and sex data from the L2 dataset is also used to show when people will reach State Pension age.

4.5.2   Additional Pension Model

- The Basic State Pension model is a payouts-based model: it is based on estimates/forecasts of pension payments at State Pension age for current and future pensioners. By contrast, the Additional Pension model is an accruals-based model. Estimates of entitlement to SERPS and S2P accrued during people's working lives (revalued by earnings growth) are used to estimate their entitlements to Additional Pension from State Pension age.

- After State Pension age, entitlements are adjusted for changes in pensioners' lives, such as widowhood. They are increased each year in line with CPI inflation until death, which is estimated using mortality rates.

- In order to produce estimates of entitlement to Additional Pension there are three stages. The first stage produces earnings factors using:
  - Numbers of jobs from DWP's cohort employment model,
  - Numbers of people by individual age earning at each of three levels:
    - between the Lower Earnings Limit and the Lower Earnings Threshold
    - between the Lower and Upper Earnings Thresholds
    - between the Upper Earnings Threshold and the Upper Accrual Point
  - Deductions for contracting out of Additional Pension into private pension schemes.

- The second stage combines the earnings factors with data on accrual rates (NI contributions) from the L2 database.

- In the third stage, for each cohort of people, entitlements accrued in a particular financial year are increased until State Pension age according to the rules on revaluation during working life, as in table above. They are then converted into a 'gross Additional Pension entitlement' for the cohort at State Pension age and this is increased from State Pension age in line with CPI inflation.

- Thus, accrued Additional Pension entitlements =
  - Earnings * rate of accrual... revalued in line with earnings growth until State Pension Age.
  - Earnings * rate of accrual... uprated in line with CPI inflation from State Pension Age.

- Carer credits are modelled separately using data on benefit caseloads, economic activity, information from the L2 database and population projections.

4.5.3   *New State Pension Model*

- The new State Pension model is an Excel based payouts model. Similar to the methodology used for the Basic State Pension model, caseload forecasts are created from the inflows into the pensioner population for each cohort reaching SPA now and in the future. The caseload forecasts are then multiplied by the relevant average state pension payment to produce an expenditure forecast at State Pension age, which is then uprated in future years.

- As with the Basic State Pension model, population projections provide numbers expected to reach State Pension age each year. Overseas inflows are based on the growth in the Great Britain population reaching State Pension age. Mortality rates again come from the population projections split by sex and single year of age.

- To calculate expenditure, the end-year caseloads are multiplied by the following formula:

Weekly rate of new State Pension x weeks in a year x MPnSR

- The MPnSR is the "mean proportion of standard rate" of the new State Pension and is between 0 and 1. It is calculated separately for each cohort and for males/females using the L2 dataset (a 1 per cent sample of HM Revenue and Customs' National Insurance Recording System). The MPnSR can be interpreted as the average proportion of the full weekly rate of new State Pension to which people in a particular cohort will be entitled when reaching State Pension age, based on their qualifying years; it includes people with no entitlement.

- The main data source used for the new State Pension model is the 'L2 dataset', a 1 per cent sample of HM Revenue and Customs' National Insurance Recording System.

- Protected Payment amounts are calculated in the same analysis that produces the new State Pension starting amount values. The Protected Payment amounts are then run through a separate Excel model to forecast the yearly Protected Payment expenditure until it is forecast to reach £0.

4.6   Public Service Pensions modelling

As was made clear in Section 1, Public Service Pensions have not been explicitly modelled. However, in order to produce the aggregate table in Section 3.5, the PSP projections from the Government Actuary's Department (GAD) for FSR 2017 were taken as a baseline. These were then adapted to incorporate EU macroeconomic assumptions on nominal GDP.